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| APPLICATION NO.   | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO. | CONFIRMATION NO. |
|---|-------------|----------------------|---------------------|------------------|
| 10/604,895  | 08/25/2003  | Ching-Hsiu Wu        | LKSP0023USA         | 1894             |
| 27765   | 7590        | 08/09/2004           | EXAMINER            |                  |
| NAIPO (NORTH AMERICA INTERNATIONAL PATENT OFFICE)<br>P.O. BOX 506<br>MERRIFIELD, VA 22116 |             |                      |                     | SMOOT, STEPHEN W |
|   |             | ART UNIT             |                     | PAPER NUMBER     |
|   |             | 2813                 |                     |                  |

DATE MAILED: 08/09/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

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|                              |                  |                |  |
|------------------------------|------------------|----------------|--|
| <b>Office Action Summary</b> | Application No.  | Applicant(s)   |  |
|                              | 10/604,895       | WU, CHING-HSIU |  |
|                              | Examiner         | Art Unit       |  |
|                              | Stephen W. Smoot | 2813           |  |

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) Responsive to communication(s) filed on 25 August 2003.
- 2a) This action is **FINAL**.                                    2b) This action is non-final.
- 3) Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) Claim(s) 1-17 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) Claim(s) \_\_\_\_\_ is/are allowed.
- 6) Claim(s) 1-3,5-9,11-13,15 and 16 is/are rejected.
- 7) Claim(s) 4,10,14 and 17 is/are objected to.
- 8) Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) The specification is objected to by the Examiner.
- 10) The drawing(s) filed on 25 August 2003 is/are: a) accepted or b) objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) All    b) Some \* c) None of:
  1. Certified copies of the priority documents have been received.
  2. Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- 1) Notice of References Cited (PTO-892)
- 2) Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)  
Paper No(s)/Mail Date \_\_\_\_\_.
- 4) Interview Summary (PTO-413)  
Paper No(s)/Mail Date. \_\_\_\_\_.
- 5) Notice of Informal Patent Application (PTO-152)
- 6) Other: \_\_\_\_\_.

## DETAILED ACTION

This Office action is in response to application papers filed on 25 August 2003.

### ***Claim Rejections - 35 USC § 103***

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

2. Claims 1-3, 5-9, 11-13, 15-16 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hsu (US 6,207,556 B1) in view of Iriki (US 2002/0081758 A1) and Wolf and Tauber (pp. 429-434, 518-520).

Referring to Fig. 2A and column 3, lines 24-38, Hsu discloses a plurality of metal lines formed on a semiconductor substrate (200). Also, Hsu discloses a conformal silicon-rich oxide dielectric layer (204) formed over the metal lines (202) by a CVD process. Referring to Fig. 2D and column 4, lines 1-16, Hsu discloses forming a via opening (216) to one of the metal lines (202) by a photolithographic process. These are limitations set forth in claims 1, 7-8, 11 of the applicant's invention.

However, Hsu lacks the first spin-on step, the examining step, the cleaning step, the drying step, and the second spin-on step set forth in claims 1, 11 of the applicant's invention. Hsu also lacks the further limitations to claim 1 set forth in claims 2-3, 5-6, 9 of the applicant's invention and the further limitations to claim 11 set forth in claims 12-13, 15-16 of the applicant's invention.

Regarding claims 1, 5-6, 9, 11, 15-16, Iriki teaches a method that includes depositing a first resist film for patterning a wafer, evaluating the developed pattern, removing the first resist film if it fails the evaluation, and re-applying a second resist on the wafer (see paragraph [106]). Also, regarding claims 5, 15, Iriki teaches that the resist film can be an organic film (see paragraph [116]), which implies a low dielectric constant material. Wolf and Tauber teach that spin coating is widely used to apply resist (see page 431, first full sentence). Also, regarding claims 6, 9, 16, Wolf and Tauber teach that resist can be removed by wet etching or by dry etching processes (see page 518). Wolf and Tauber further teach that a wafer needs to be clean and free of moisture prior to applying resist (see pages 429-430) and, that wafers can be cleaned by brush scrubbing (see page 519) and dehydrated by baking (see paragraph bridging pages 429 and 430). Regarding claims 2, 12, Iriki teaches that resist patterns can be tested for dimensional accuracy (see paragraph [0117]). Regarding claims 3, 13, Iriki teaches that resist patterns can be tested for defects and irregularities (see paragraph [0117]).

Therefore it would have been obvious to a person of ordinary skill in the art at the time the invention was made to combine the teachings of Hsu with those of Iriki and

Wolf and Tauber in order to pattern the via opening of Hsu by applying resist using the above processing techniques taught by Iriki and by Wolf and Tauber.

Iriki recognizes that testing a resist film and reapplying the film if it does not meet the test criteria ensures that the resist pattern will be accurately transferred to the underlying wafer (see paragraph [0117]). Wolf and Tauber recognize that spin coating is one known way to apply resist, that both wet etching and dry etching methods are known ways to remove resist, and that cleaning a wafer by brush scrubbing and drying the wafer by baking to remove moisture are known ways to prepare the wafer for the successful application of a resist film.

### ***Allowable Subject Matter***

3. Claims 4, 10, 14, 17 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form to include all of the limitations of the base claim and any intervening claims.

4. The following is a statement of reasons for the indication of allowable subject matter:

- Claims 4, 14 would be allowable because the prior art of record does not teach or suggest, in combination with the other claim limitations, a spin-on process that includes forming a first dielectric layer, completely removing the first dielectric layer based on an examining step, and re-performing the spin-on process to form

a second dielectric layer, wherein both dielectric layers are composed of spin-on glass material; and

- Claims 10, 17 would be allowable because the prior art of record does not teach or suggest, in combination with the other claim limitations, a spin-on process that includes forming a first dielectric layer, completely removing the first dielectric layer based on an examining step, and re-performing the spin-on process to form a second dielectric layer, wherein the first dielectric layer is removed using a buffered hydrofluoric etching solution.

### ***Conclusion***

5. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Hu et al. and Jiang et al. teach wafer cleaning by scrubbing. Knight et al. teach the removal and reapplication of a photoresist layer based on examination of the first layer.

6. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Stephen W. Smoot whose telephone number is 571-272-1698. The examiner can normally be reached on M-F (8:00am to 4:30pm).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Carl Whitehead, Jr. can be reached on 571-272-1702. The fax phone

number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

sws

*Stephen V. Smoot*  
Patent Examiner  
Art Unit 2813